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NPIC/TSSG/RED-1756-69

MEMORANDUM FOR : Chief, Advanced Technology Branch, RED

25X1 SUBJECT : [] Image Processing Projects

1. As part of the RED/ITS study to develop a comprehensive coordinated image processing program for NPIC, the [] contributions in this field have been reviewed. Initial contacts have been made - the situation to date is described herein.

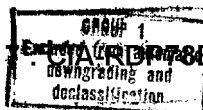
25X1 2. [] is addressing the Image Processing field (digital image enhancement, input/output devices, etc.) with separate programs at several of its eleven divisions. In an effort to inform NPIC of their efforts, []

25X1 [] arranged for a series of briefings by [] representatives at the facilities concerned. Initially, an overview was presented by []
25X1 [] on 30 July 1969. The work underway at the [] was described by [] on 31 July 1969. As of now one other briefing, at IBM/FSD, [] is scheduled for 27 August 1969. The substance of the two meetings to date is summarized below.

25X1 b. [] explained that while [] had no company-wide program in image processing (i.e., no one organizational element charged with R&D of better I/O devices, software, etc.), there were several projects underway in this area. The one most concerned with digital

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25X1 input/output of photographic/optical images is under the direction
25X1 of [] Research Center. Computerized
25X1 image processing techniques are being studied by []
25X1 [] Digital enhancement
25X1 techniques for photographic images and telemetry data are being inves-
25X1 tigated by [] The
25X1 [] Systems Development Division, [] is building a
25X1 drum scanner for TOPOCOM, Ft. Belvoir, with [] acting
25X1 as the official point of contact for both organizations. Some work in
25X1 image processing is underway at the []
25X1 [] The nature of their efforts was unknown and will be
25X1 communicated to NPIC in the future. [] is performing
25X1 some CRT scanner input/output experiments for [] The
25X1 scanner was not operational at the moment and will be demonstrated at
25X1 a later date. It was pointed out that the CRT scanner at []
25X1 is not of the same high capability as the high precision scanner being
25X1 developed by []

25X1 c. In a general exchange of comments among those present, it
25X1 became evident that the projects of Messrs. []
25X1 were attacking objectives of immediate interest to NPIC. In addition,
25X1 it was indicated that [] would be responsive to an overall program in
25X1 the image processing field proposed by NPIC.

25X1 d. [] discussed a very recent [] development called the
25X1 Image Storing Vidicon (ISV). Unlike the usual TV tube, the ISV retains
25X1 a very high quality image up to 30 minutes, without any refreshing such
25X1 as occurs in a stop-action TV system. The ISV is, in a sense, an elec-
25X1 tronic camera since image formation results from a special light sensi-
25X1 tive material activated by an electron beam. The image remains so long
25X1 as it is scanned whether or not the object has moved. While stored, the
25X1 image can be viewed or transferred or both using conventional techniques.
25X1 Though still under development, the ISV has the properties and is being
25X1 considered for application as indicated below:

(1) Resolution (TV lines) 800-1000 on a 5/8 inch square
active element (there is evidence that 2000 lines is not
unreasonable).

(2) Sensitivity in terms of typical camera units, 1/50
sec., at f/5.6.

(3) Image can be erased by exposure to 10 foot-candles of
light for five seconds (they hope to improve this)

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(4) Applications:

a. low bandwidth communication of high resolution imagery.

b. moving target indicator, real-time; i.e., in TV loop.

c. on line image enhancement.

d. closed circuit TV distribution.

25X1 e. The ISV will be ready to demonstrate after 11 August 1969. [] will contact [] and arrange to include this on the agenda for his visit if desired.

4. Discussions with []
Center

25X1 a. [] discussed the following topics:

(1) Lens testing device

(2) Development of a precision CRT scanner

25X1 (3) The [] ~~Criteria~~ "Criteria" for the analysis of noisy signals.

(4) Film edge gradient analysis is a measure of the system transfer function

25X1 b. The lens testing device is employed to measure the optical transfer function of microscope lenses and other optical systems designed and built by [] for production of microcircuitry. It is designed to operate with a digital computer (they use a dedicated 1620) to perform the necessary data reduction. In addition to being operational, it has many advantages over other commercially available lens testers.

c. The precision CRT scanner (input/output) is still under development and will be ready for testing in 12-18 months. Should outside funds become available, this period could be reduced by 6 months. The scanner output is fed to a computer (the same one used for the lens tester) where digital manipulation is performed as required. The CRT will accommodate up to 9" film; however, it scans this film in 1 inch square micrements, the film being stepped through the optical system until the entire area is covered. The scanning

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25X1 time is being designed to transfer 100 1/mm images from film without appreciable loss; if less resolution is acceptable, the input/output time will decrease accordingly. Spot diameters of 7 and 2.5 microns can be used with a precision of 1/16 spot diameter. The scanner will have a random access capability to allow mensuration. The cost of the first scanner will be approximately [] A suitably equipped computer would cost about [] Technical details will be the subject of a separate memorandum. 25X1

25X1 d. The [] Criteria" for signal analysis is an integral part of the software associated with the lens tester and the precision scanner. It is a mathematical-statistical technique for separating signal from noise with theoretical and practical advantages over the other techniques in use. It can be applied to any digital image processing system. I shall discuss the details with [] during my conversations with him later this month. The basic concepts are not proprietary and have been made available without cost. The details of the [] Criteria" will also be the subject of a separate memorandum. 25X1

25X1 e. The determination of a system MTF from measurements made on the photographic image of an edge has been investigated by [] and others. In each case the result was that in practice the technique was too inaccurate because of film non-linearity and the low signal to noise ratio. Applying the [] Criteria" to the EGA technique has caused [] to fund additional work in this area. Initial experiments using corn target edges, and conducted in conjunction with [] yielded promising results. This effort is just getting underway. Further experiments planned include an evaluation of the effective exposure hypothesis and treatment of image boundary distortions such as those produced in dual-gamma processing. Additional details will be obtained during my visit to [] on 27 August 1969. 25X1 25X1

25X1 5. Discussion

a. The projects described above, together with the image processing software writing ability, illustrated by the success of their efforts in the near real-time surveyor and Mariner programs, make [] a potential participant in any image processing program under taken by NPIC. 25X1

25X1 b. Unlike some other firms interested in this [] [] is not in the position of requiring external funding before further work is performed. 25X1

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25X1 c. [] has offered to demonstrate, without charge, the lens testing device on a series of NPIC microscope objectives. This would provide, for the first time, a comparison of quality among the objectives and indicate the degree to which they approach the diffraction limit (best possible performance optically) a standard they are often assumed to meet. With your approval, these experiments could be executed in September.

25X1 6. Future Plan of Action - The [] image processing capabilities and ideas will be considered in terms of existing and future requirements. Specific recommendations will be included in the overall image processing plan to be submitted by 15 September 1969

[]
TSSG/RED/ITS

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Distribution:

Original - Addressee

1 - RED/ITS

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25X1 NPIC/TSSG/RED [] (19 August 1969)

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